

# **EXHIBIT E**

# Radio Frequency Analysis Report

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CT3405  
Lot N-4 Sequin Drive, Glastonbury, CT



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December 21, 2020



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## 1. Overview

C Squared Systems was retained by New Cingular Wireless PCS, LLC (“AT&T”) to evaluate the proposed wireless communications facility at Lot N-4 Sequin Drive, Glastonbury, CT at 111 feet AGL, hereinafter referred to as “CT3405”.

AT&T is licensed by the FCC to provide wireless communications services throughout the State of Connecticut including the Town of Glastonbury where the proposed facility would be located. The proposed facility has been selected as suitable for implementation of the National Public Safety Broadband Network (“NPSBN”), while also addressing a substantial gap in 4G LTE coverage for AT&T’s network.

This report addresses AT&T’s need for the proposed wireless facility and confirms that there are no other suitable existing structures that could address the coverage gaps in their wireless communications network.

The coverage analysis completed by C Squared Systems confirms: AT&T has a gap in reliable service in Glastonbury, and that Candidate “CT3405” provides AT&T with coverage in that service gap. Included as attachments in this report are coverage maps detailing the existing network and expected coverage from the proposed facility, pertinent site information, terrain and network layout maps.

## 2. Technology Advances & Design Evolution

AT&T provides digital voice and data services using 3rd Generation (3G) UMTS technology in the 800 MHz and 1900 MHz frequency band, and advanced 4th Generation (4G) services over LTE technology in the 700 MHz and 1900 MHz frequency bands as allocated by the FCC. These data networks are used by mobile devices for fast web browsing, media streaming, and other applications that require broadband connections. The mobile devices that benefit from these advanced data networks are not limited to basic handheld phones, but also include devices such as smartphones, PDA’s, tablets, and laptop air-cards. 4G LTE services and devices have enabled AT&T customers to have even faster connections to people, information, and entertainment.

AT&T will also deploy FirstNet services from this facility. FirstNet is a federal agency with a mandate to create a nationwide, interoperable public safety broadband network for first responders. First responders across the country currently rely on more than 10,000 separate radio networks which oftentimes do not interoperate with one another. By deploying a nationwide broadband public safety network built specifically to meet the communications needs of first responders, the FirstNet network will provide a solution to the decades-long interoperability and communications challenges first responders have experienced, and which was highlighted by the 9/11 Commission’s 2004 Final Report.

FirstNet selected AT&T to build, manage and operate the National Public Safety Broadband Network (“NPSBN”) using FirstNet’s Band 14 spectrum (Call Sign WQQE234, 20 MHz of the 700 MHz spectrum), together with AT&T’s own wireless network. Using a combination of new and existing wireless facilities, AT&T provides prioritized, preemptive wireless services for first responders across Connecticut, New England and nationwide, while also improving 4G LTE coverage for AT&T customers.

It is important to note that with AT&T’s migration from 3G to 4G services come changes in the base station infrastructure and resultant changes in the operating thresholds required by the LTE network. In the past, AT&T has presented receive signal thresholds of -74 dBm for their in-building coverage threshold and -82 dBm for their in-vehicle coverage threshold. Those thresholds were based on network requirements to support 2G/3G data speeds and past usage demand. Today, customers expect low latency and faster data speeds as evidenced by increasing data usage trends and customer demand.

AT&T's 4G LTE technology is designed to thresholds of -83 dBm and -93 dBm for their 700 MHz LTE and -86 dBm and -96 dBm for their 1900 MHz LTE.<sup>1</sup> The stronger thresholds (-83 dBm and -86 dBm) yield greater throughputs and improved customer experience. The -93 dBm and -96 dBm thresholds are the minimum acceptable levels required to meet customer expectations for 4G service.

### 3. Coverage Objective

There is a significant coverage deficiency in the existing AT&T wireless communications network along East Main Street and the neighboring residential and business/retail areas in Glastonbury, referred to herein as the "targeted area". A deficiency in coverage is evidenced by the inability to adequately and reliably transmit/receive quality calls and/or utilize data services offered by the network. Seamless reliable coverage provides users with the ability to successfully originate, receive, and maintain quality calls and data applications throughout a service area. Appropriate overlapping coverage is required for users to be able to move throughout the service area and reliably "hand-off" between cells to maintain uninterrupted connections.

AT&T is expanding and enhancing their 4G LTE high-speed wireless broadband services throughout New England by filling in existing coverage gaps and addressing capacity, interference, and high-speed broadband issues. In addition to improving 4G LTE coverage for AT&T customers, AT&T is also building, managing and operating the National Public Safety Broadband Network using FirstNet's 700 MHz Band 14 spectrum, in order to provide prioritized, preemptive wireless services for first responders across Connecticut, New England and nationwide.

Due to terrain characteristics and the distance between the targeted coverage area and the existing sites, AT&T's options to provide services in this area are quite limited (maps of the terrain in this area and the distance to neighboring AT&T sites from the proposed site are included as Attachments 1 & 2, respectively). AT&T's network requires deployment of antennas throughout the area to be covered. These antennas are connected to receivers and transmitters that operate in a limited geographic area known as a "cell." AT&T's wireless network, including their wireless handsets and devices, operate by transmitting and receiving low power radio frequency signals to and from these cell sites. The signals are transferred to and from the landline telephone network and routed to their destinations by sophisticated electronic equipment. The size of the area served by each cell site is dependent on several factors, including the number of antennas used, the height at which the antennas are deployed, the topography of the land, vegetative cover and natural or man-made obstructions in the area. As customers move throughout the service area, the transmission from the portable devices is automatically transferred to the AT&T facility with the best connection to the device, without interruption in service provided that there is overlapping coverage from the cells.

In order to define the extent of the coverage gap to be filled, propagation modeling has been conducted in the area of Glastonbury. Propagation modeling uses PC software to determine the network coverage based on the specific technical parameters of each site including, but not limited to, location, ground elevation, antenna models, antenna heights, and also databases of terrain and ground cover in the area.

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<sup>1</sup> The threshold range differences between the 700 MHz and 1900 MHz frequency bands directly correlates to the type branch diversity receivers deployed in AT&T's receiver design.

Analysis of the propagation modeling in Glastonbury reveal that AT&T's network is unreliable throughout much of the area due to gaps in coverage, and that there is a service deficiency as a result. In order to fill in these coverage gaps and improve the network reliability to Glastonbury, a new facility is needed in the area.

Included in this report are Attachments 1 through 5, which are explained below to help describe AT&T's 4G network deployment in and around Glastonbury, and the need for the proposed facility.

- Attachment 1: "*CT3405 Area Terrain Map*" details the terrain features around the area of deficient service being targeted by the proposed site in Glastonbury. These terrain features play a key role in determining site designs and dictating the unique coverage achieved from a given location. This map is included to provide a visual representation of the ridges and valleys that must be considered when siting a wireless facility. The darker green and blue shades correspond to lower elevations, whereas the orange and red shades indicate higher elevations.
- Attachment 2: "*CT3405 Neighbor Site Data*" provides site specific information of existing neighboring sites used to perform the coverage analysis provided in Attachments 1 and 4.
- Attachment 3: "*CT3405 Existing 700 MHz LTE Coverage*" for the Current AT&T Network depicts 700 MHz LTE coverage from existing sites and demonstrates that there are currently gaps in 700 MHz LTE coverage effecting service within the targeted area. The coverage shown is where the signal strengths are: > -83 dBm (minimum level required reliable, high quality service and performance at 700 MHz) and, > -93 dBm (minimum required for adequate level of service at 700 MHz). In an effort to provide the required levels of coverage to these areas, AT&T is proposing to install a wireless facility at the East Main Street location.
- Attachment 4: "*CT3405 Existing 700 MHz LTE Coverage with Proposed Site*" shows how this proposed site would fill in the existing coverage gaps and improve AT&T's 700 MHz LTE network.
- Attachment 5: *Connecticut DOT Average Annual Daily Traffic Data – Glastonbury* shows the available vehicular traffic volume data for the subject area from the Connecticut Department of Transportation. This data shows as many as 49,400 vehicles per day passing in close proximity to the proposed site.

Table 1 below lists the coverage statistics compiled for the AT&T's 700 MHz 4G LTE network with the deployment of the Proposed Site.

	<b>Incremental Coverage from Proposed Site (700 MHz)</b>	
<b>Population:<sup>2</sup></b>	( $\geq$ -83 dBm)	1,517
	( $\geq$ -93 dBm)	1,578
<b>Business Pops:<sup>3</sup></b>		
	( $\geq$ -83 dBm)	2,721
	( $\geq$ -93 dBm)	1,040
<b>Area (mi<sup>2</sup>):</b>		
	( $\geq$ -83 dBm)	1.16
	( $\geq$ -93 dBm)	0.89
<b>Roadway (mi):</b>		
	Main (-93 dBm):	0.9
	Secondary (-93 dBm):	7.0
	<b>Total (-93 dBm):</b>	<b>7.9</b>

Table 1: Coverage Statistics

<sup>2</sup> Population figures are based upon 2010 US Census Block Data

<sup>3</sup> Employee population counts are based upon the 2011 U.S. Census Bureau LEHD database.

## 4. Conclusion

AT&T has identified an area of deficient coverage affecting a significant portion of Glastonbury CT, including key traffic corridors through the residential and business/retail areas of the Town. Candidate “CT3405” will bring the needed fill-in coverage to significant portions of East Main Street and the residential neighborhoods and business/retail areas in the vicinity of the proposed location

No existing structures were identified and available that would be able to satisfy the coverage requirements needed for this area.

As discussed in this report and depicted in the attached plots, the proposed interim AT&T site will provide a substantial portion of the coverage being lost to the “Target Area” while maintaining effective connectivity to the rest of AT&T’s existing network. In addition to providing improved LTE service to AT&T’s customers throughout the targeted areas of Glastonbury, AT&T is providing enhanced services for first responders through the implementation of FirstNet’s National Public Safety Broadband Network (“NPSBN”).

## 5. Statement of Certification

I certify to the best of my knowledge that the statements in this report are true and accurate.



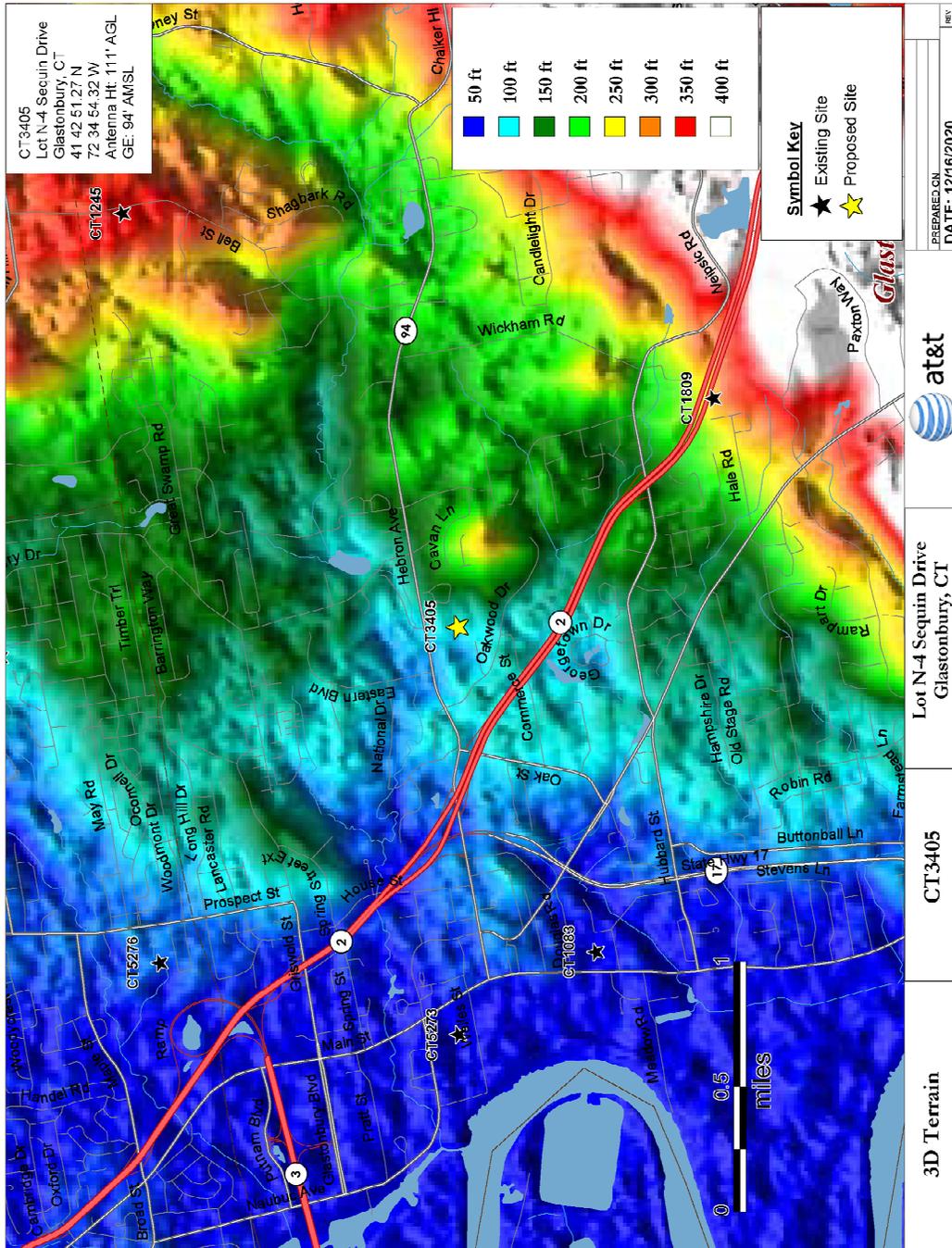
December 21, 2020

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Date

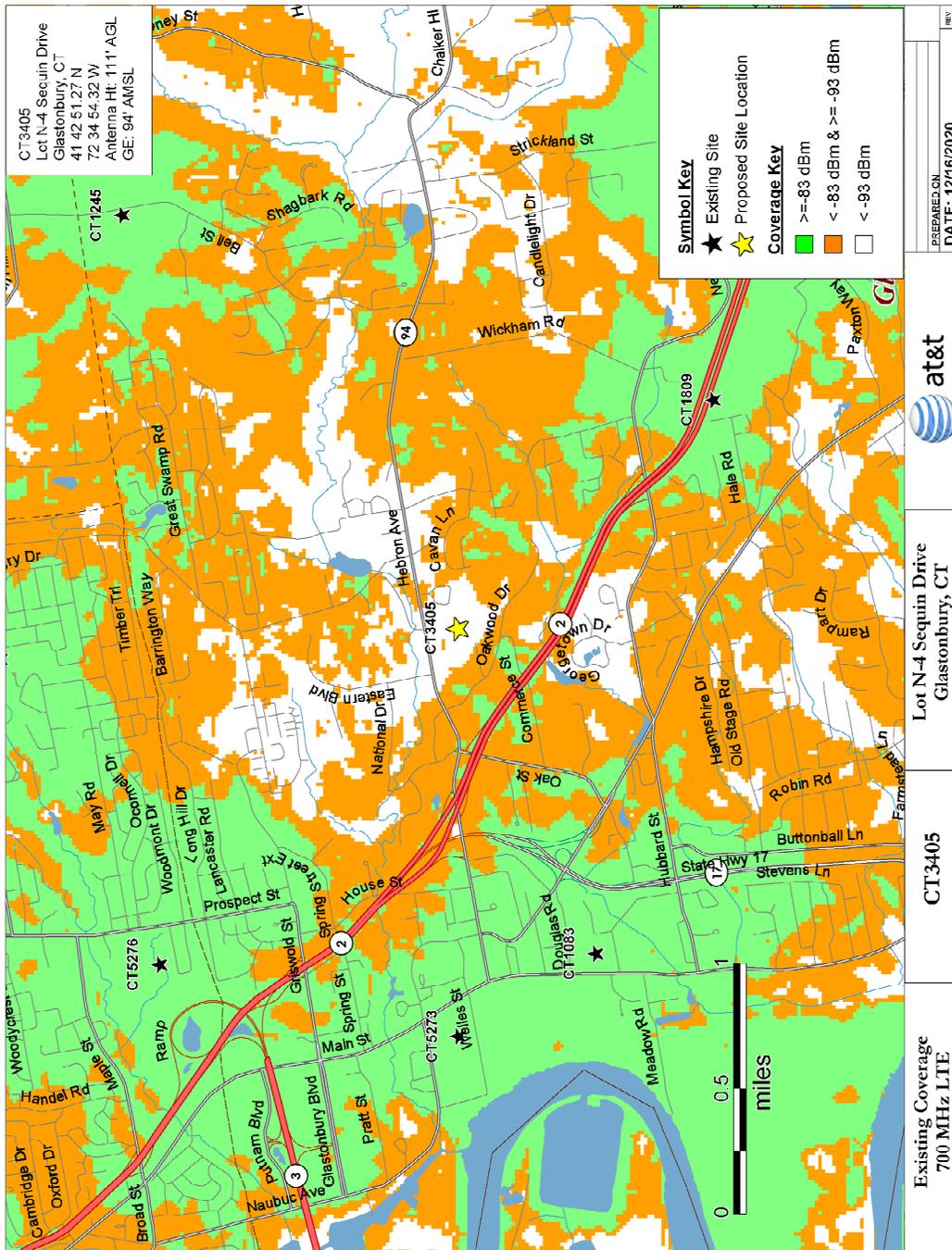
# 6. Attachments



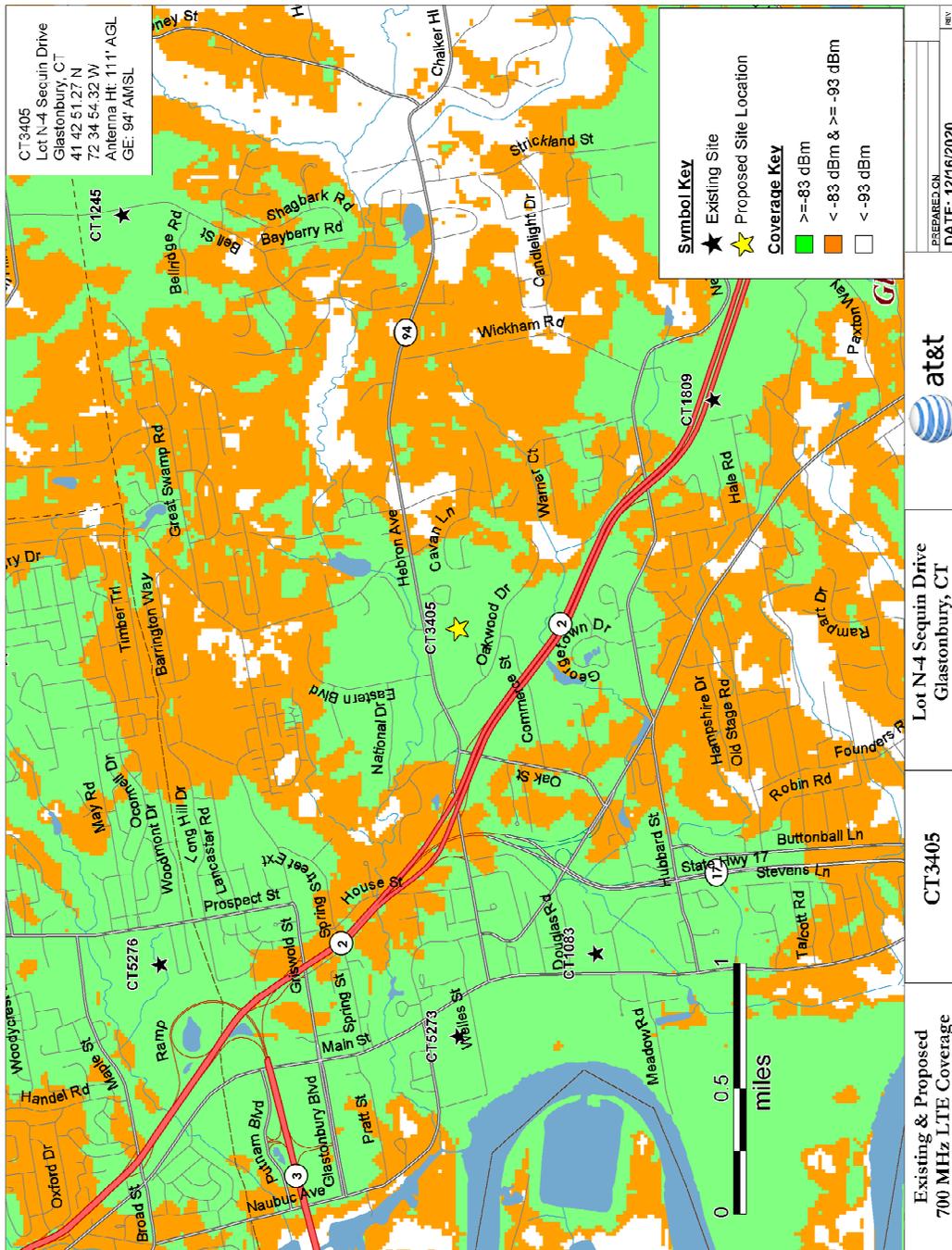
Attachment 1: CT3405 Area Terrain Map

Name	Latitude	Longitude	Street Address	City	Antenna Centerline	Ground Elevation	Structure Type
CT1034	41.7407	-72.5841	465 Hills Street	East Hartford	100	105	Monopole
CT1083	41.7062	-72.6069	Glastonbury Police Department	Glastonbury	166	39	Self Support
CT1100	41.6936	-72.5474	366 Three Mile Road	Glastonbury	138/140	479	Monopole
CT1245	41.7336	-72.5497	577 Bell Street	Glastonbury	90	338	Self Support
CT1809	41.6994	-72.5640	58A Montano Road	Glastonbury	100	246	Monopole
CT5273	41.7142	-72.6133	2577 Main Street	Glastonbury	108/110	20	Self Support
CT5276	41.7315	-72.6078	1455 Forbes Avenue	East Hartford	120/130	56	Monopole
CT5321	41.7469	-72.5641	575 Hillstown Road	Manchester	70	180	Utility

## Attachment 2: CT3405 Neighbor Site Data



Attachment 3: CT3405 Existing 700 MHz LTE Coverage for the Current AT&T Network



Attachment 4: CT3405 Existing 700 MHz LTE Coverage with Proposed Site for the AT&T Network

